

**Policy-Related Approaches to Reducing
Environmental Tobacco Smoke Exposure in the Workplace**

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Introduction

During the past few decades, health hazards caused by environmental tobacco smoke (ETS) exposure have been increasingly recognized. Among the best-established health hazards are lung cancer in healthy adult nonsmokers and childhood disorders (e.g., respiratory tract ailments) [CA EPA 1999; NRC 1986; DHHS 1986; EPA 1992].

As scientific knowledge of health risks caused by ETS exposure has increased, understanding of such risks has grown also. Included in the change in public attitudes toward ETS is the reframing of smoking as a wider social issue beyond a personal behavior. Public policies to eliminate ETS exposure have similarly increased in frequency and scope over the past decade [Brownson et al. 1997]. However, knowledge is limited regarding the overall effectiveness of these policies in controlling ETS, particularly the potential benefits of smoking bans beyond elimination of nonsmokers' exposure (e.g., smoking cessation among smokers). There is also sparse research on the effects of enforcement, worker acceptance of bans, and financial costs and benefits.

This paper describes a) workplace policy initiatives that have been designed to reduce ETS exposure, b) effects and effectiveness of such policy measures, and c) areas for future policy development and research.

Scope of ETS Exposures and Workplace Policies

Numerous reasons exist for restricting smoking in public places.

1. ETS causes acute and chronic diseases in otherwise healthy nonsmokers.
2. The majority of the public experiences annoyance and discomfort from ETS exposure and views ETS as a health hazard.
3. Many nonsmokers do not take personal action to avoid exposure to ETS when smokers light up in their vicinity.
4. Employers could realize lower maintenance and repair costs, insurance costs, and higher nonsmoker productivity when smoking is prohibited in the workplace.
5. Restricting smoking in work settings might increase the likelihood that smokers in these settings smoke fewer cigarettes or quit smoking entirely.

Assessing Workplace ETS Exposure

Several investigations of ETS exposure in the workplace and other settings have built the foundation for ETS control policies. In a study of 663 nonsmokers attending a cancer screening [Cummings et al. 1990], 76% of participants reported ETS exposure during the four days before the screening. The authors concluded that the workplace and the home were the primary sources of ETS exposure among nonsmokers. The best single predictor of urinary cotinine was the number of friends and family members who smoke, and who are seen regularly by the subject. In a study of 881 nonsmoking volunteers [Marcus et al. 1992], employees in workplaces that allowed smoking were > 4 times more likely to have detectable saliva cotinine concentrations than those working in places with smoking bans. Among 186 former and never smokers using a self-reported exposure diary (without biochemical validation), approximately 50% of the daily ETS exposure was attributed to the workplace [Emmons et al. 1992]. However, for persons who lived with a smoker, more exposure occurred in the home than in the workplace.

The number of comprehensive studies of the levels of ETS exposure in the workplace are limited. In a review of existing studies [Siegel 1993], differences were reported in ETS concentrations by location, as measured by mean levels of nicotine in the ambient air of offices ($4.1 \mu\text{g}/\text{m}^3$), restaurants ($6.5 \mu\text{g}/\text{m}^3$), bars ($19.7 \mu\text{g}/\text{m}^3$), and residences ($4.3 \mu\text{g}/\text{m}^3$) with at least one smoker.

The most recent U.S. data from 1995–1996 show that 64% of indoor workers are covered by a 100% smoking ban in the workplace [Burns et al. in press]. The proportion of workers who work in a smoke-free workplace varies considerably by state, from 84% in Maryland and Utah to 40% in Nevada.

Policy Options

For employers and policy makers, certain options exist regarding regulation of ETS in the workplace. Among the options, the least desirable is use of a designated smoking area without separate ventilation. This option provides only minimal protection to nonsmokers; previous studies have reported substantial exposure to ETS in workplaces with smoking areas without separate ventilation [Repace 1994]. The next option is the use of separately ventilated smoking lounges, which protect nonsmokers but are costly and could elevate lung cancer risk among smokers [Siegel et al. 1995]. Third, an option exists for use of separately ventilated smoking lounges with a recommended duration of 30 minutes or less per day, which could minimize health risks to both nonsmokers and smokers [59 Fed. Reg. 15968 (1994)]. Finally, the optimal alternative is a totally smoke-free workplace.

Today, nearly all U.S. workplaces regulate smoking. In 1985, approximately 38% of U.S. workers were employed by firms that had policies restricting smoking [Farrelly et al. 1999]. According to the 1999 National Worksite Health Promotion Survey, 79% of workplaces with 50 or more employees had formal smoking policies that prohibited or limited smoking to separately ventilated areas [DHHS 2000a]. The objective for Healthy People 2010 is 100% [DHHS 2000b]. Limited systematic data exist regarding enforcement of existing policies to restrict workplace smoking. National data also suggest that, despite protections, workers in blue-collar and service occupations are much more likely to be exposed to workplace ETS than white-collar workers [Gerlach et al. 1997].

Government policies. Presently, the only notable federal regulation of ETS is the smoking ban on airline flights originating or arriving in the United States. This ban was strongly supported by flight attendants. Other critical federal actions have included bans on smoking in federal office buildings, the symbolic ban on smoking in the White House, and bans on smoking in childcare facilities that receive federal funds. The Occupational Safety and Health Administration proposed regulations that would either prohibit smoking or limit it to separately ventilated areas [OSHA 1994]. As of 1998, 20 states and the District of Columbia had limited smoking in private workplaces [CDC 1998]. However, only one state law (California) met the Healthy People 2000 objective of banning indoor smoking or limiting it to areas with separate ventilation. Clean indoor air ordinances at the city and county levels first appeared in the early 1970s, and have been reported to affect workplace ETS exposure [Moskowitz et al. 1999; Pierce et al. 1994]. Currently, approximately 1,000 local ordinances in the United States restrict public smoking. However, governmental laws and regulations often exclude workplaces with fewer than 50 workers from coverage.

Data are limited regarding the effectiveness of enforcement mechanisms. Further, few resources have been dedicated to enforcement of ETS ordinances, and the majority of the regulatory action is assumed to be self-enforcing.

Private sector restrictions. In the United States, hospitals have voluntarily implemented a nationwide smoking ban. This ban was announced in November 1991, and full implementation was required by December 31, 1993. Two years after implementation, the policy was successful, with 96% of hospitals complying with the smoking ban standard [Longo et al. 1995]. Corporations in other industries have implemented smoking bans without legislation or regulatory actions. For example, bans in fast-food restaurants such as McDonald's and Taco Bell are a response to concern for children's health and to consumer demand. Another example is the proliferation of nonsmoking rooms in motels and hotels. These changes reflect the hospitality industry's response to market demand. As such, private corporate policies not mandated by law serve as a market barometer of public opinion regarding the desirability of smoke-free indoor air. These changes are intended to protect the health of patrons, but also benefit workers in these service industries.

Effects and Effectiveness of Workplace Clean Indoor Air Policies

Although workplace clean indoor air regulations influence nonsmokers' ETS exposure and smokers' behavior, evaluation data to quantify these effects are limited. Such changes are inherently difficult to evaluate because of the complex interaction of social forces that shape behavior, and the overlapping effects of concomitant regulatory policies (e.g., a new clean indoor air law and an increase in the cigarette excise tax). In recent years, researchers have increasingly recognized the role of the legal, social, economic, and physical environment in influencing individual smoking behavior (e.g., the smoking policy in a workplace) [Brownson et al. 1997; NCI 1991].

Regulatory interventions within the workplace environment are based on the premise that individuals are strongly influenced by the social environment in which they act. Smokers frequently respond to environmental cues when deciding whether or not to smoke [NCI 1991]. A cue to smoke can come after a work break, whereas a cue not to smoke can come after entering a smoke-free workplace. Many cues have their origins in rules regarding acceptable behaviors, such as social norms.

Studies of Workplace Bans

Attitudes and social norms. Studies of awareness and attitudes toward workplace smoking restrictions and bans have been conducted in cross-sectional samples of the general population, and among employees affected by bans. Even a decade ago, in a survey of 10 U.S. communities [CDC 1991], smoking restrictions or bans were favored by the majority of all respondents in all locations including bars, restaurants, hospitals, workplaces, and government buildings. Although support for smoking restrictions was higher among nonsmokers, 82 to 100% of smokers favored restrictions on smoking in public places. Support was highest for smoking bans in indoor sports arenas, hospitals, and doctors' offices [CDC 1991]. Among city workers in Canada, satisfaction with workplace smoking restrictions was high after implementation of a new smoking law [Pederson et al. 1993].

In studies of hospital smoking bans, patients, employees, and physicians overwhelmingly support the policy; in one study [Becker et al. 1989], a majority of smokers supported a hospital smoking ban. Studies of smoking restrictions and bans in other industries also have reported high satisfaction among nonsmokers who are in favor of workplace bans. In a prospective study of a smoking ban in a large workplace [Borland et al. 1990], attitudes of both nonsmokers and smokers toward the ban were more favorable 6 months after the ban was implemented. Although a majority of smokers was inconvenienced by the ban, they also recognized the overall benefits of the ban. Among city workers in Toronto, who were subject to stringent smoking restrictions in the workplace, 58% were "very satisfied" with the workplace smoking policy [Pederson et al. 1996]. Other data from Canada demonstrate that employees in small workplaces were least knowledgeable regarding smoking restrictions and were less willing to intervene in coworkers' smoking [Ashley et al. 1997]. The literature shows how public agencies, the private sector, and organized labor can work together to implement ETS policies [National Association for Public Health Policy 1997].

Effects on nonsmokers' exposure. Workplace smoking bans have been effective in reducing nonsmokers' exposure to ETS. Effectiveness has been measured by the perceived air quality in the workplace after a smoking ban and by active measurement of nicotine vapor. Conversely, workplace policies that allow smoking in designated areas without separate ventilation result in substantial nonsmoker exposure to ETS [Repace 1994]. In a cross-sectional study of 25 Massachusetts workplaces [Hammond et al. 1995], a strong correlation was reported between distributions of nicotine concentrations and smoking policies. Median nicotine concentrations varied from 8.6 $\mu\text{g}/\text{m}^3$ in open offices that allowed smoking, to 1.3 $\mu\text{g}/\text{m}^3$ in workplaces that restricted smoking, to 0.3 $\mu\text{g}/\text{m}^3$ in sites that banned smoking.

Selected studies, regarding the effects of workplace smoking bans on ETS exposure, represent a "best-evidence" subset on the basis of methods developed by the U.S. Task Force on Community Preventive Services (Table 1) [Briss et al. 2000; Truman et al. 2000; Zaza et al. 2000] (see also www.thecommunityguide.org). This method of categorizing intervention studies evaluates study design and execution. Despite different metrics used among these studies, the overall body of evidence demonstrates that workplace smoking bans are effective in reducing ETS exposure. However, certain studies were conducted > 10 years ago and do not consider approaches, such as separately ventilated smoking areas, that are now being used to reduce ETS exposure in the workplace (e.g., separately ventilated smoking areas).

Effects on smoking behavior. Certain studies have assessed the potential effects of workplace smoking bans on employee smoking behavior. These studies have been conducted in healthcare settings, government agencies, insurance companies, telecommunication companies, and among random samples of the working population. Effects of workplace smoking bans on employee smoking behavior can be considered from different perspectives, including impact on cigarette consumption, smoking cessation, and overall smoking prevalence within the workplace. Although > 70 English-language studies have been published regarding the effects of workplace smoking bans

worldwide, one group of studies represents a "best-evidence" subset (Table 2) [Briss et al. 2000; Truman et al. 2000]. Among these studies, consistent evidence exists that workplace bans result in a reduction of daily cigarette consumption. Based on the U.S. studies, consumption has declined by approximately 3 cigarettes/day in response to a workplace smoking ban. Effects on smoking cessation are less clear. Although studies [Longo et al. 1996] report that smoking bans increase rates of quitting, the body of evidence is limited and inconsistent. A limited number of well-designed and well-executed studies could be found, but whether workplace smoking bans contribute to overall changes in smoking cessation and prevalence is unclear.

Overall (population wide) effects on consumption. Two groups of researchers have summarized the overall effects of workplace smoking bans on cigarette consumption on a population basis. One study attributed recent declines in cigarette consumption in the United States and Australia to smoke-free workplaces [Chapman et al. 1999]. In the United States, workplace bans were estimated to be responsible for 12.7% of the 76.5 billion decrease in cigarette consumption during 1988–1994. If workplace bans were universal, the annual number of cigarettes forgone in the United States would increase to 20.9 billion. A related study [Farrelly et al. 1999] reported that smoke-free workplaces reduced average daily cigarette consumption by 14% relative to workers with minimal or no restrictions. That study further estimated that a total workplace smoking ban would reduce smoking prevalence by an absolute amount of 2.6% and a relative value of 10%. Although certain cross-sectional studies did not meet the criteria for "best evidence" (Table 2), overall, these studies report a consistent and substantial effect of workplace smoking policies on cigarette consumption, recent smoking cessation, and overall smoking prevalence.

Conclusion and Recommendations

During the 1960s–1990s, substantial progress was made in protecting workers from ETS exposure. Despite these gains, health risks remain, and the following recommendations are warranted.

As reported in other papers presented at this Proceedings, certain subgroups such as service and blue-collar workers are at highest risk for ETS exposure in the workplace and deserve special attention.

Policies and regulations often exclude workplaces of < 50 persons, yet these employees represent a substantial workforce.

Although bans and other restrictions have become common, there remains sparse information on the most effective means of enforcing bans at the local level.

Beyond eliminating ETS exposure among nonsmokers, smoking bans could have additional synergistic benefits, including increased smoking cessation and reductions in the overall smoking prevalence. Well-designed and well-executed studies in this area are needed.

The cost implications to employers of workplace ETS policies are not clear because sparse information is available regarding the costs and cost-effectiveness of various workplace smoking policies. Better assessments are needed of the effects of smoking bans on workplace productivity.

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